FIG. 1

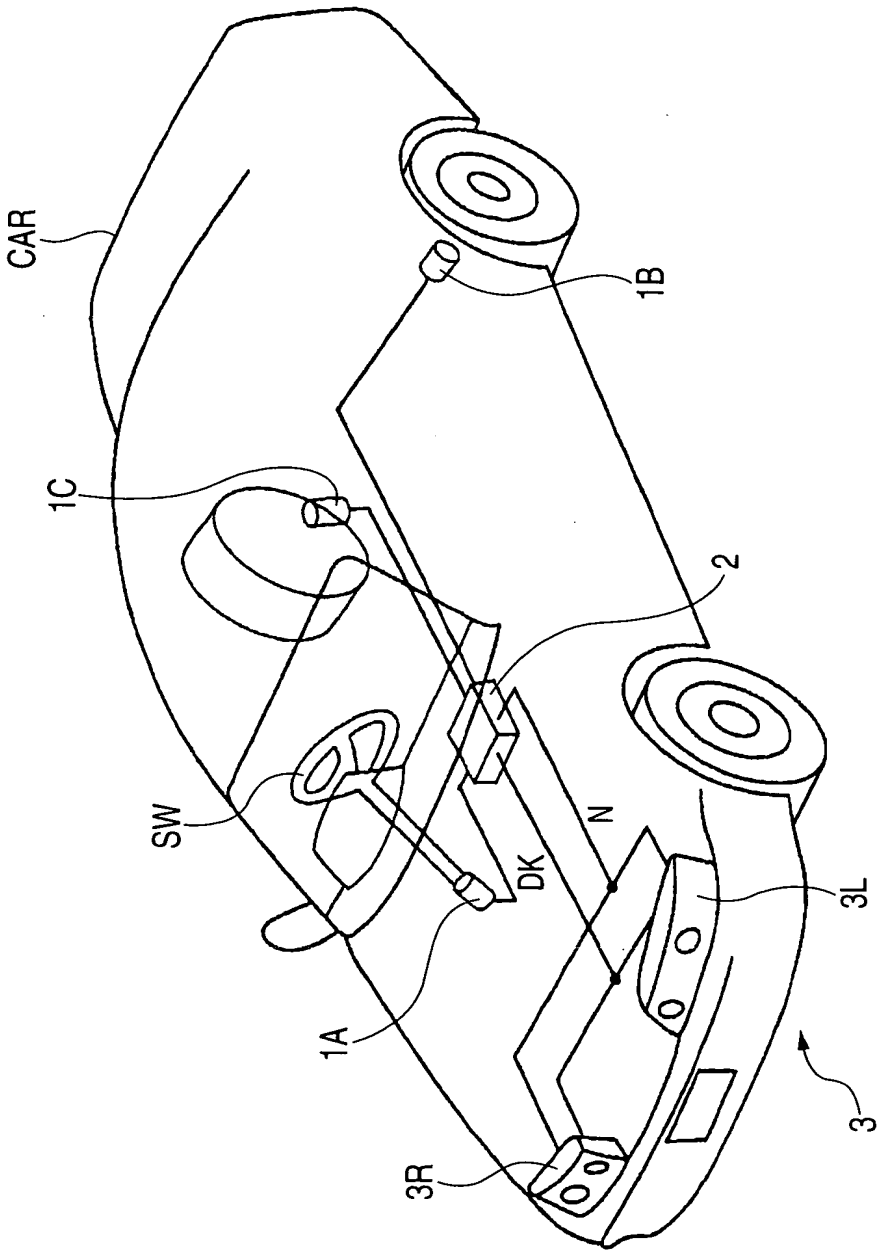

FIG. 2

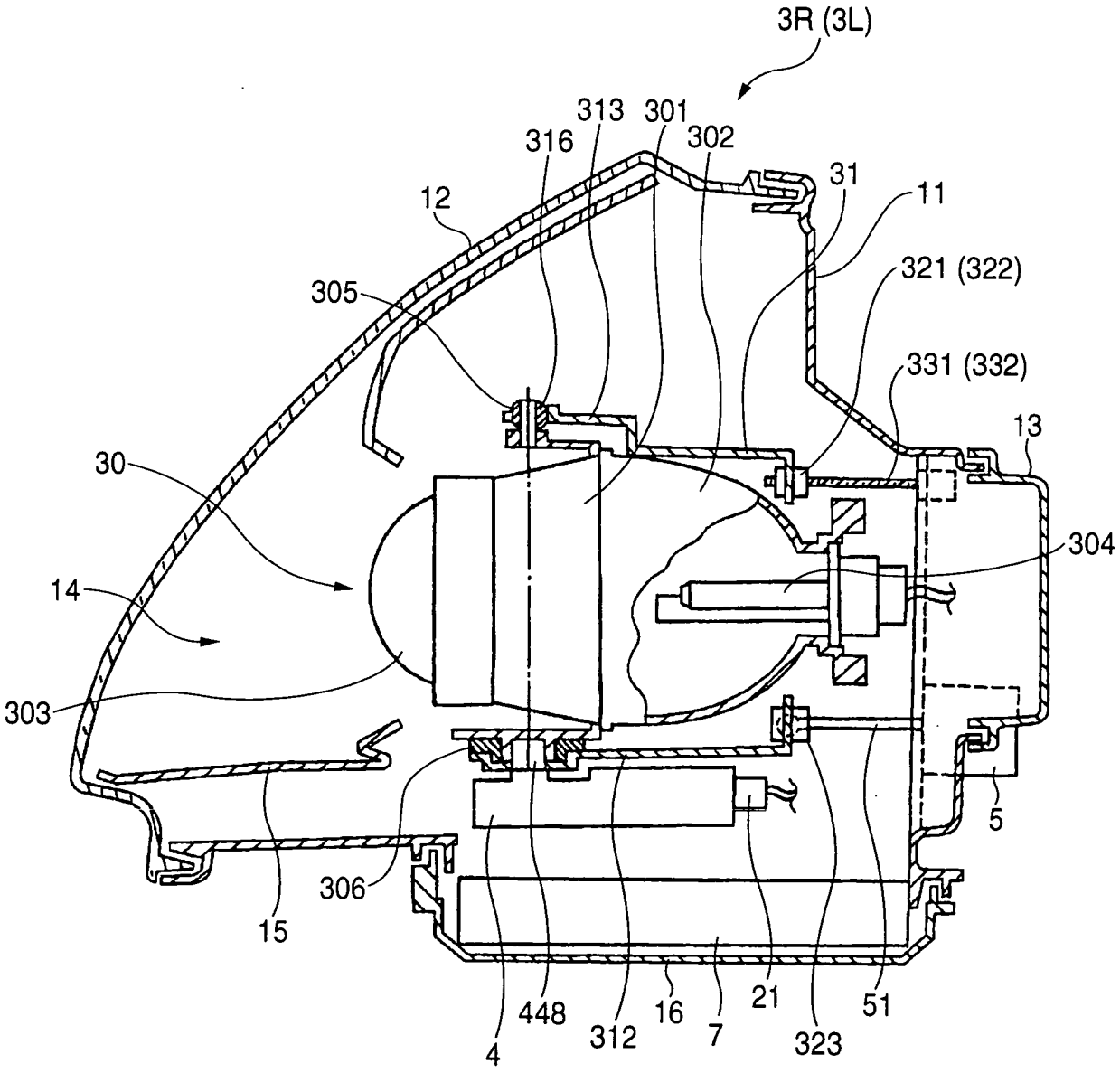
3R (3L)
313
301
316
302
31
12
11
321 (322)
305
331 (332)
13
30
304
14
303
5
306
15
448
312
16
7
21
323
51
4

FIG. 3

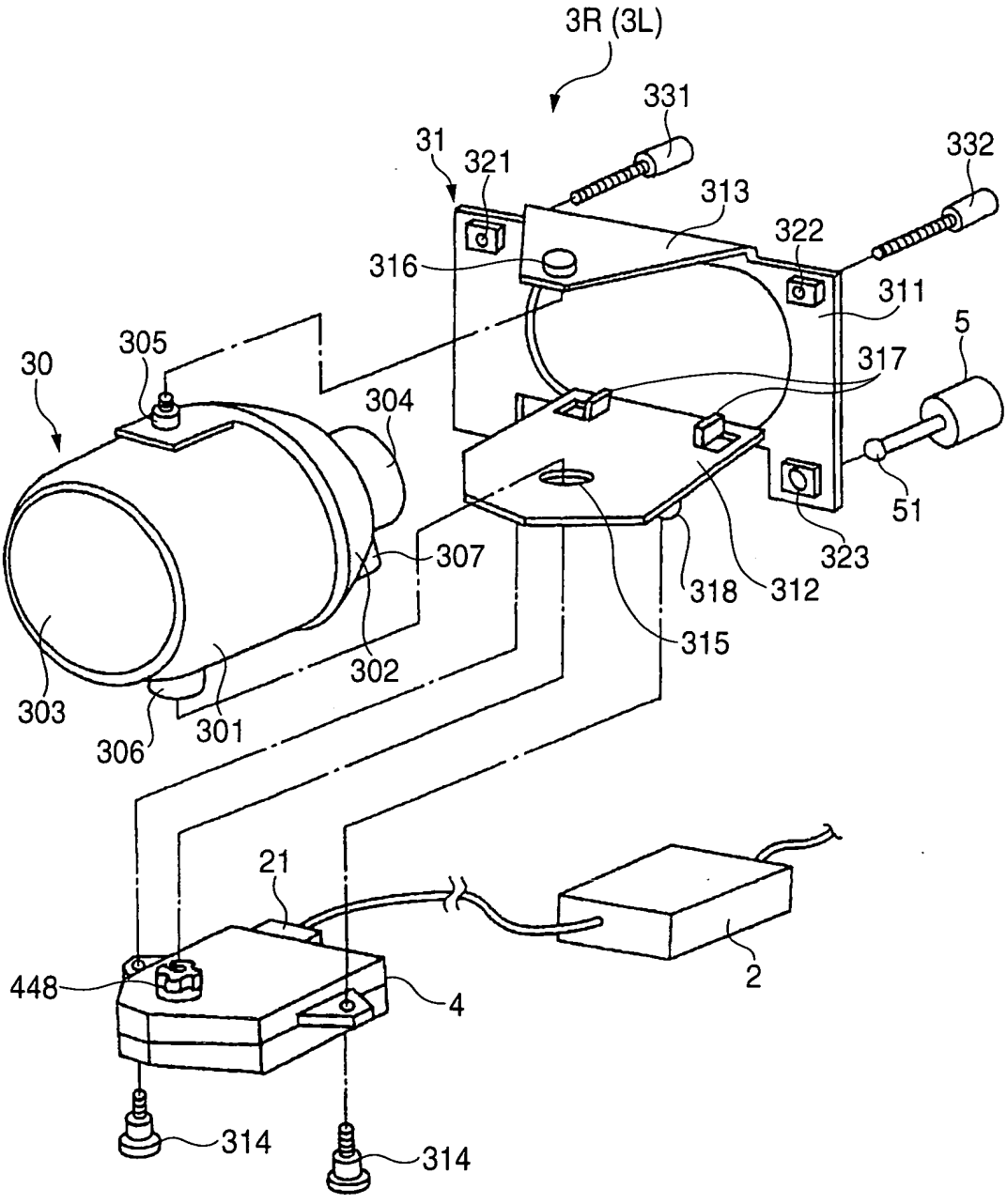
3R (3L)
331
31
321
332
313
322
316
311
5
305
317
30
304
51
307
323
318
312
315
303
302
306
301
21
2
448
4
314
314

FIG. 4

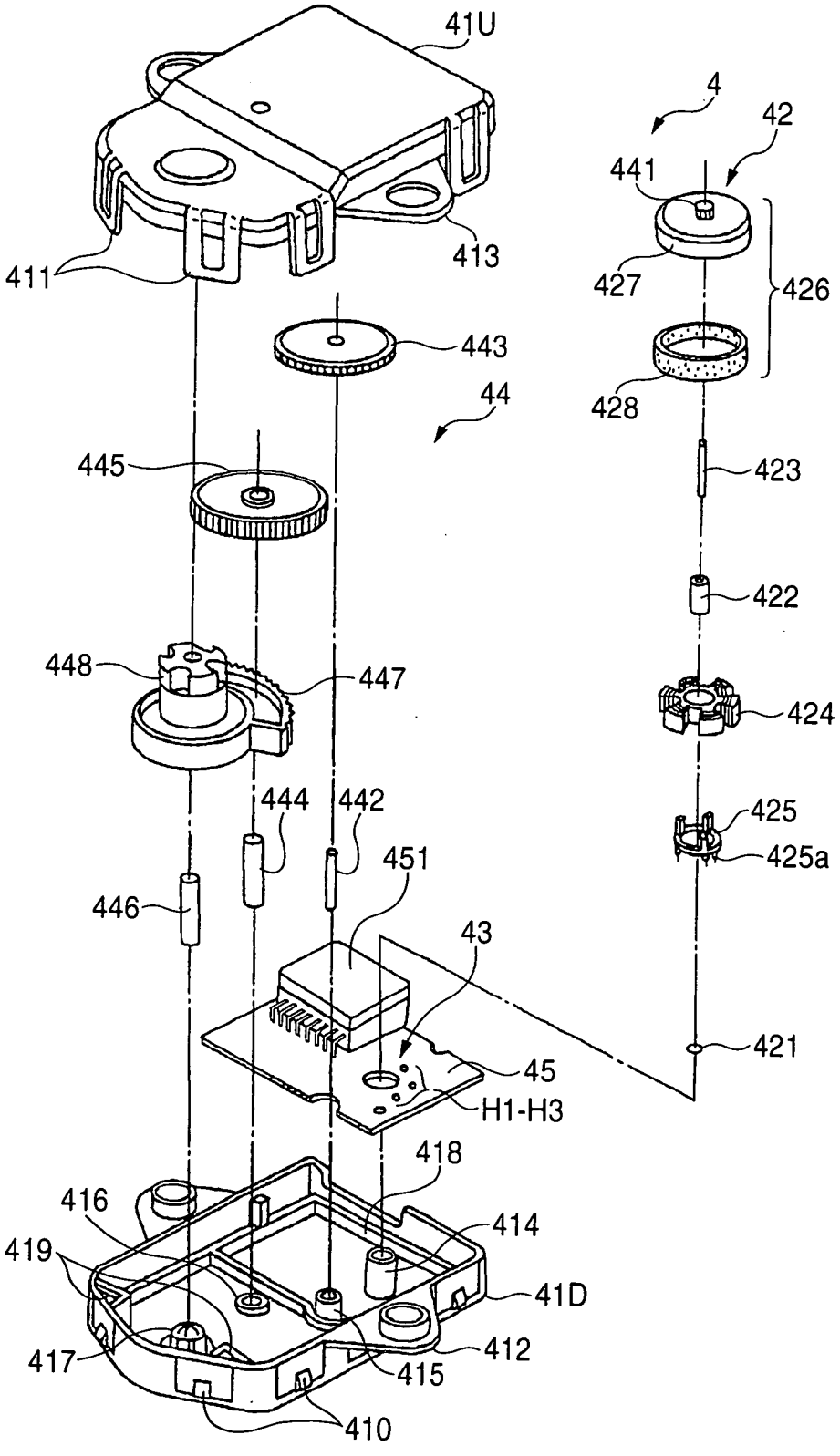
41U
4
42
441
411
413
427
426
443
428
44
445
423
422
448
447
424
444
442
425
425a
451
446
43
421
45
H1-H3
418
416
414
419
41D
412
417
415
410

FIG. 5

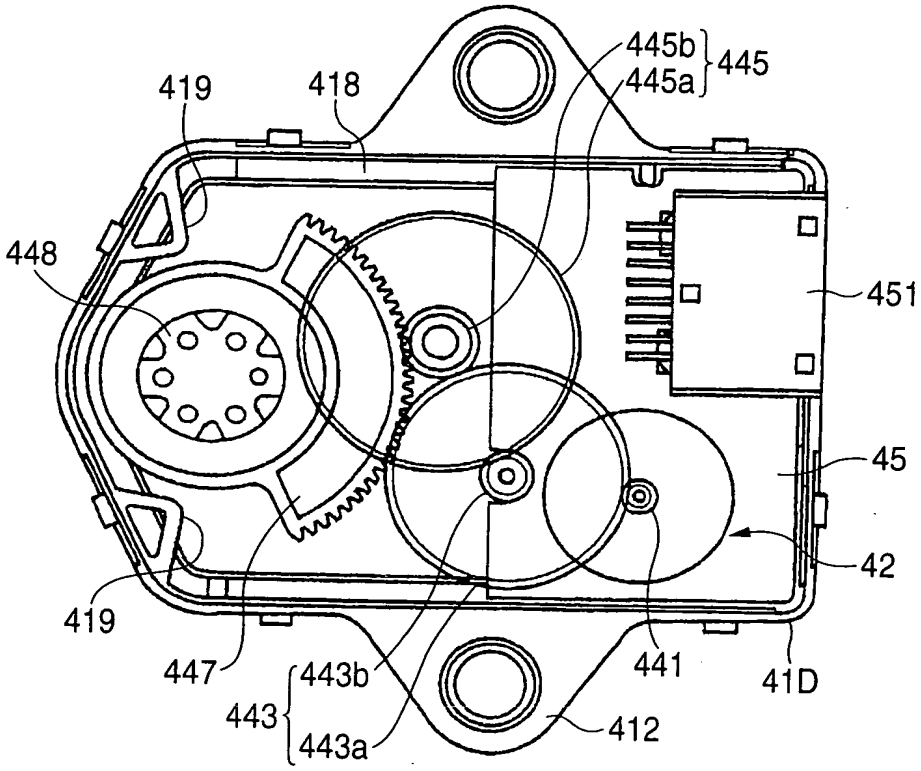
445b
445a
445
419
418
448
451
45
42
419
447
443b
443
443a
441
41D
412

FIG. 6

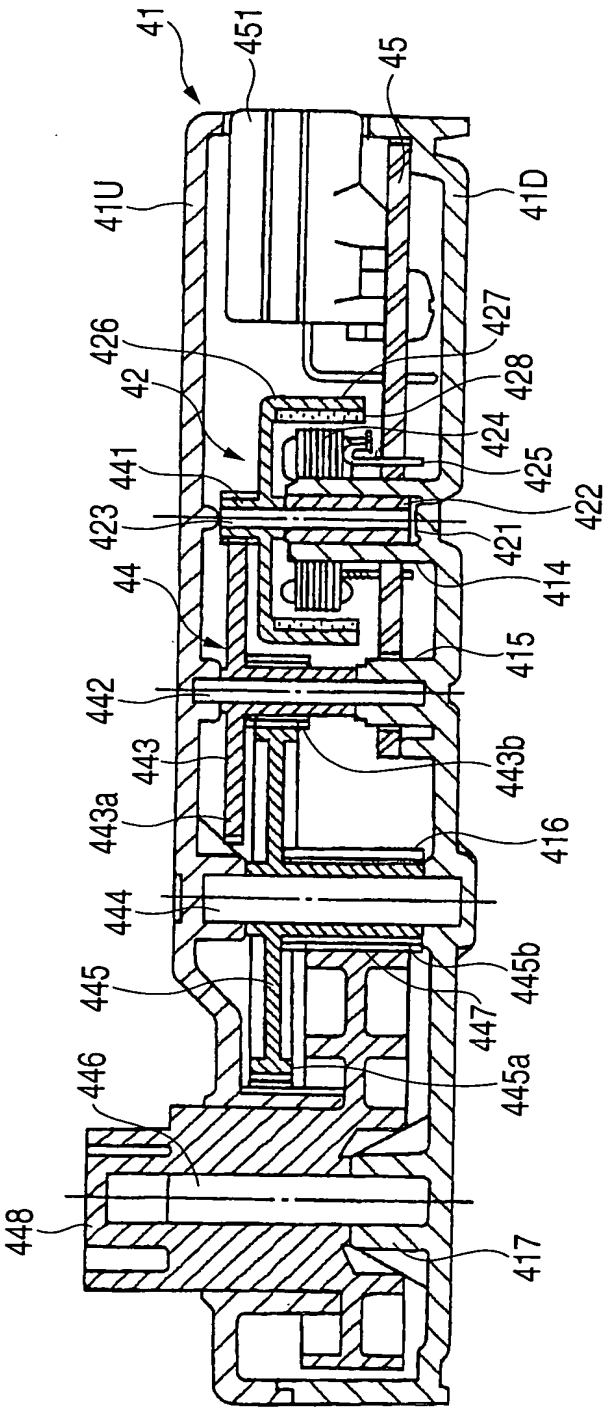
41
451
45
41U
41D
426
427
42
428
424
441
425
423
422
421
44
414
415
442
443
443b
443a
416
444
445
445b
447
446
445a
448
417

FIG. 7

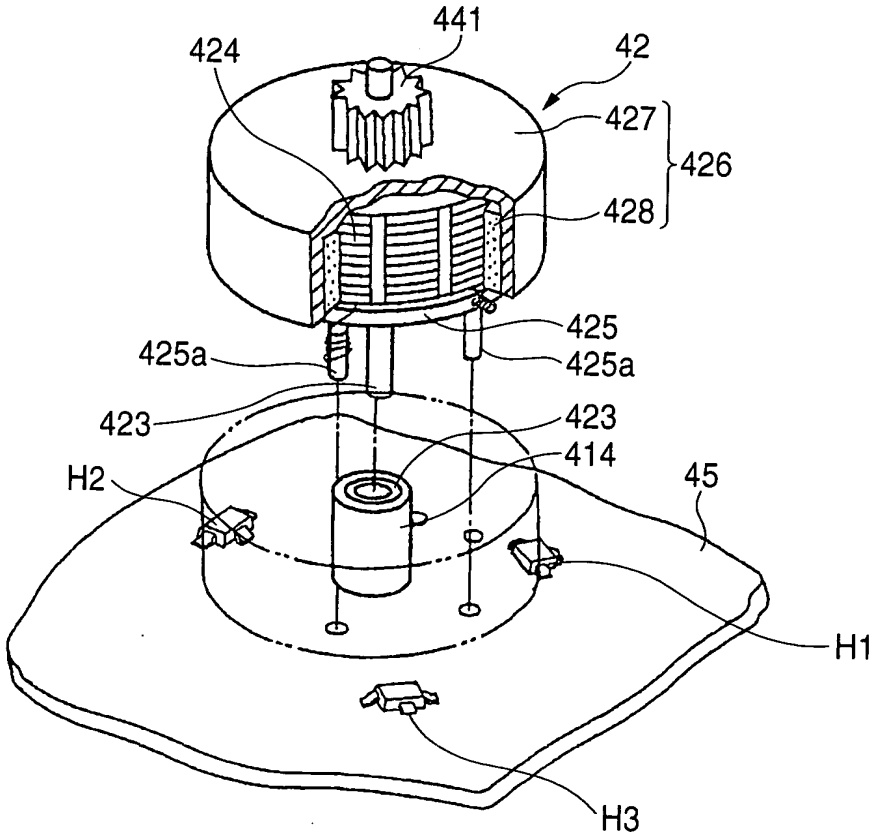

FIG. 8

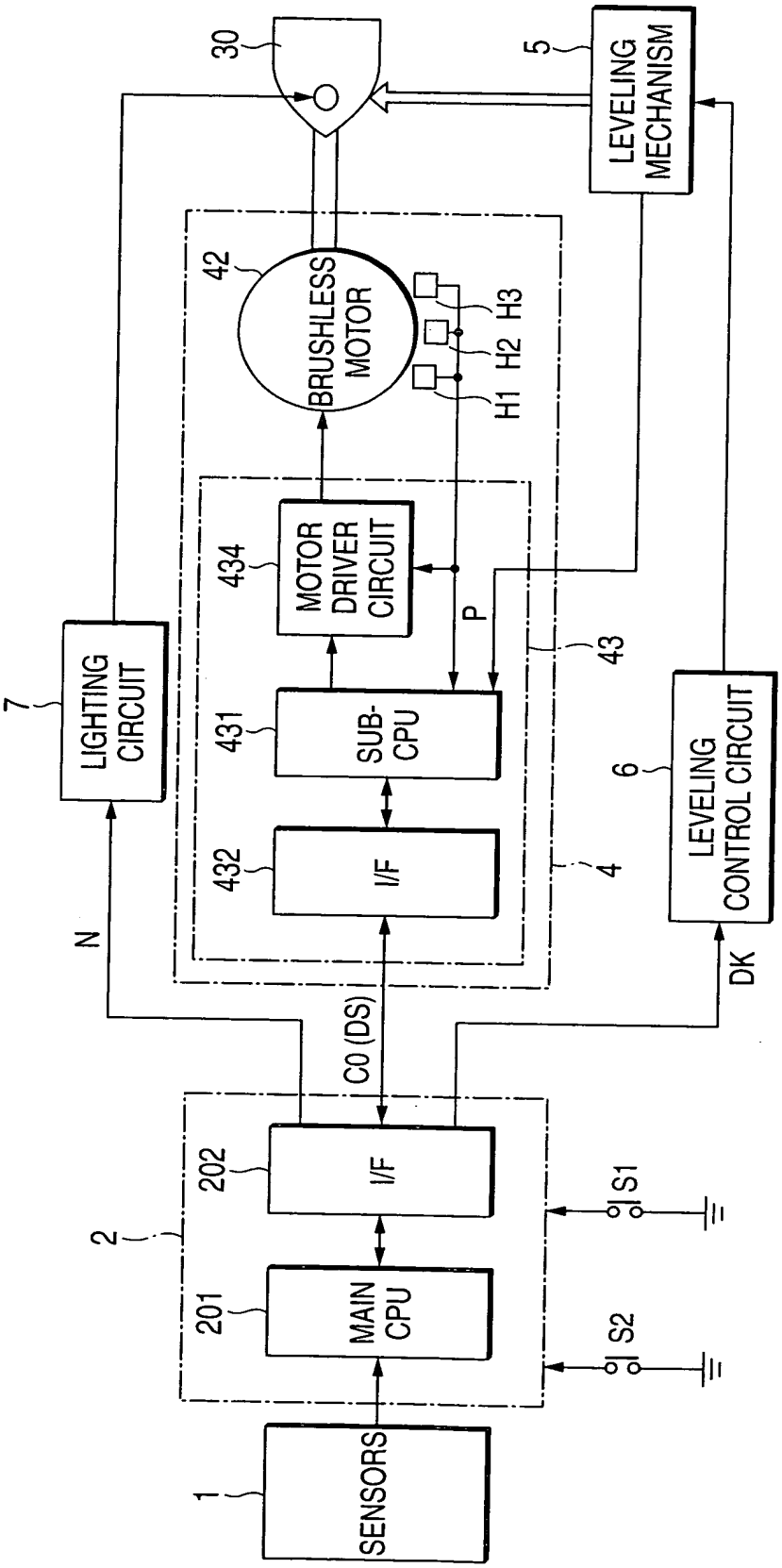
30
5
LEVELING MECHANISM
42
BRUSHLESS MOTOR
H3
H2
H1
434
MOTOR DRIVER CIRCUIT
P
43
7
LIGHTING CIRCUIT
431
SUB-CPU
6
LEVELING CONTROL CIRCUIT
432
I/F
4
N
C0 (DS)
DK
202
I/F
S1
2
201
MAIN CPU
S2
1
SENSORS

FIG. 9

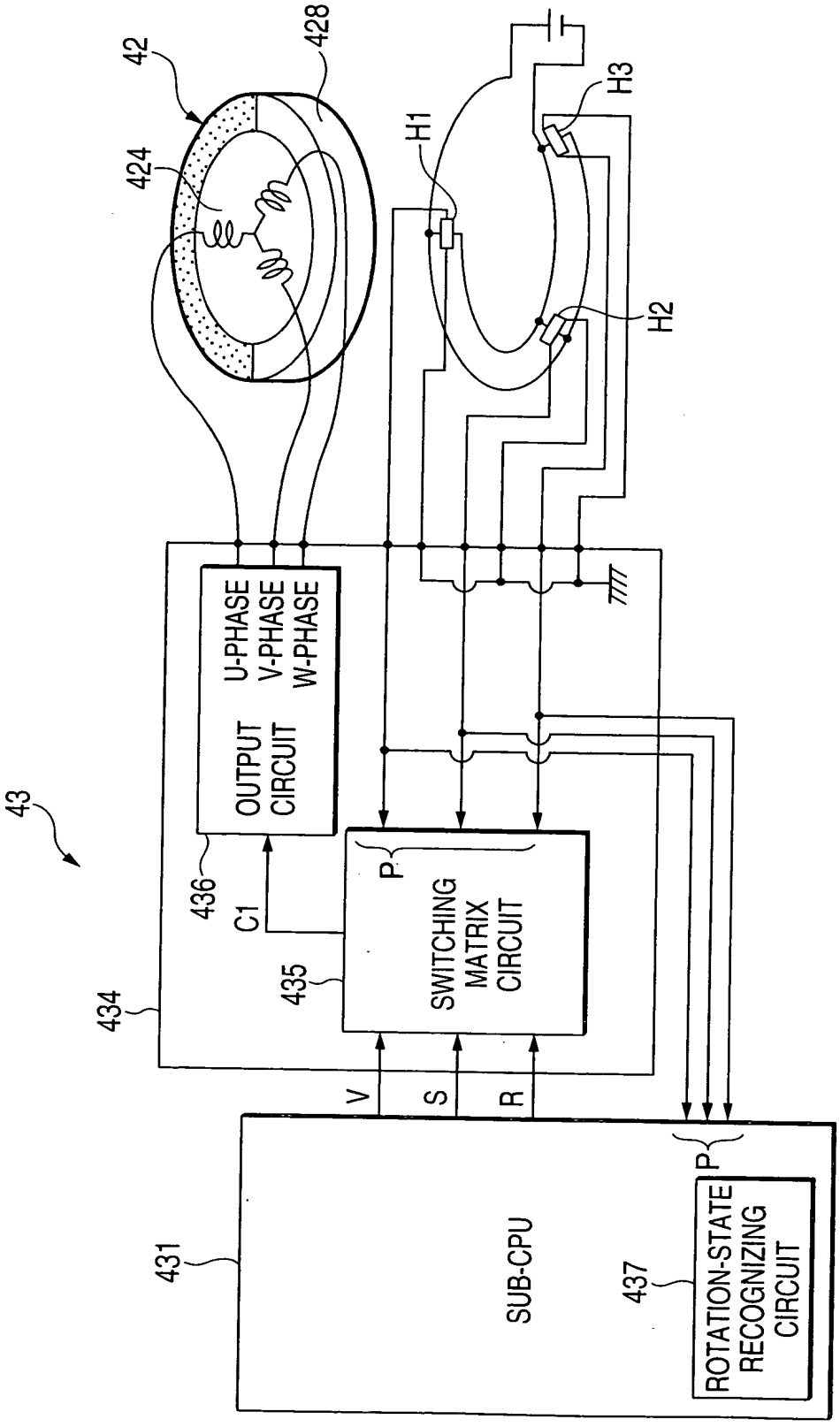
42
428
424
H1
H3
H2
43
U-PHASE
V-PHASE
W-PHASE
OUTPUT CIRCUIT
436
C1
P
SWITCHING MATRIX CIRCUIT
435
434
V
S
R
P
431
SUB-CPU
437
ROTATION-STATE RECOGNIZING CIRCUIT

FIG. 10

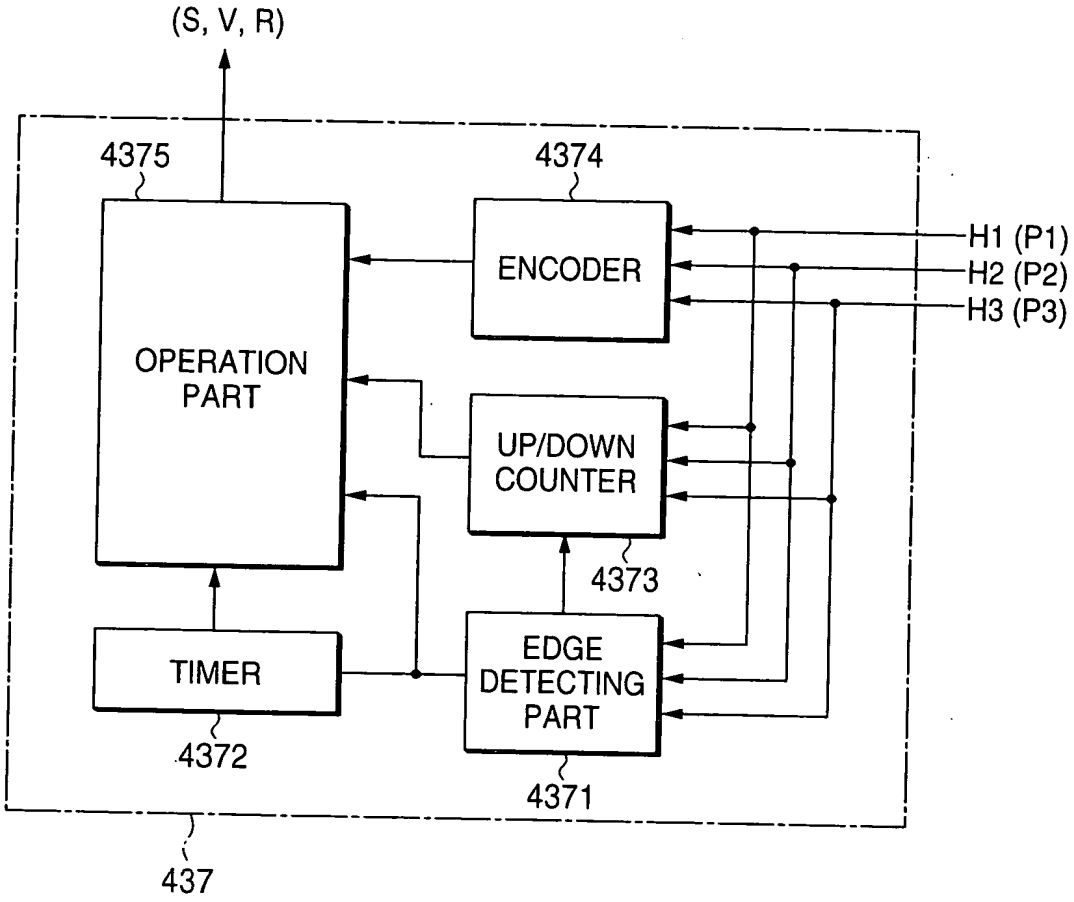
(S, V, R)
4375
4374
ENCODER
H1 (P1)
H2 (P2)
H3 (P3)
OPERATION PART
UP/DOWN COUNTER
4373
TIMER
EDGE DETECTING PART
4372
4371
437

FIG. 11

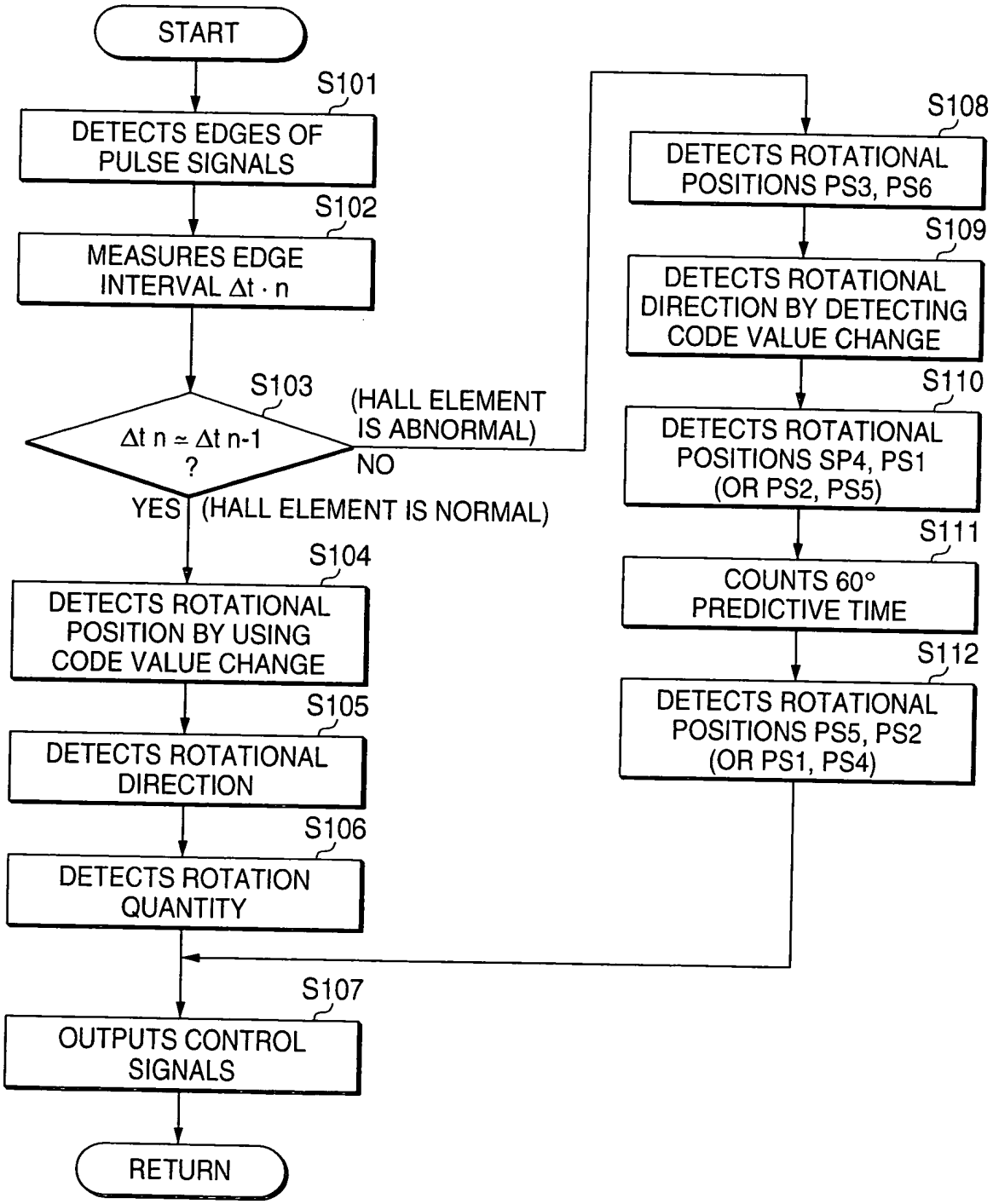
START
S101
DETECTS EDGES OF PULSE SIGNALS
S102
MEASURES EDGE INTERVAL Δt · n
S103
Δt n ≃ Δt n-1 ?
(HALL ELEMENT IS ABNORMAL)
NO
YES
(HALL ELEMENT IS NORMAL)
S104
DETECTS ROTATIONAL POSITION BY USING CODE VALUE CHANGE
S105
DETECTS ROTATIONAL DIRECTION
S106
DETECTS ROTATION QUANTITY
S107
OUTPUTS CONTROL SIGNALS
RETURN
S108
DETECTS ROTATIONAL POSITIONS PS3, PS6
S109
DETECTS ROTATIONAL DIRECTION BY DETECTING CODE VALUE CHANGE
S110
DETECTS ROTATIONAL POSITIONS SP4, PS1 (OR PS2, PS5)
S111
COUNTS 60° PREDICTIVE TIME
S112
DETECTS ROTATIONAL POSITIONS PS5, PS2 (OR PS1, PS4)

FIG. 12A

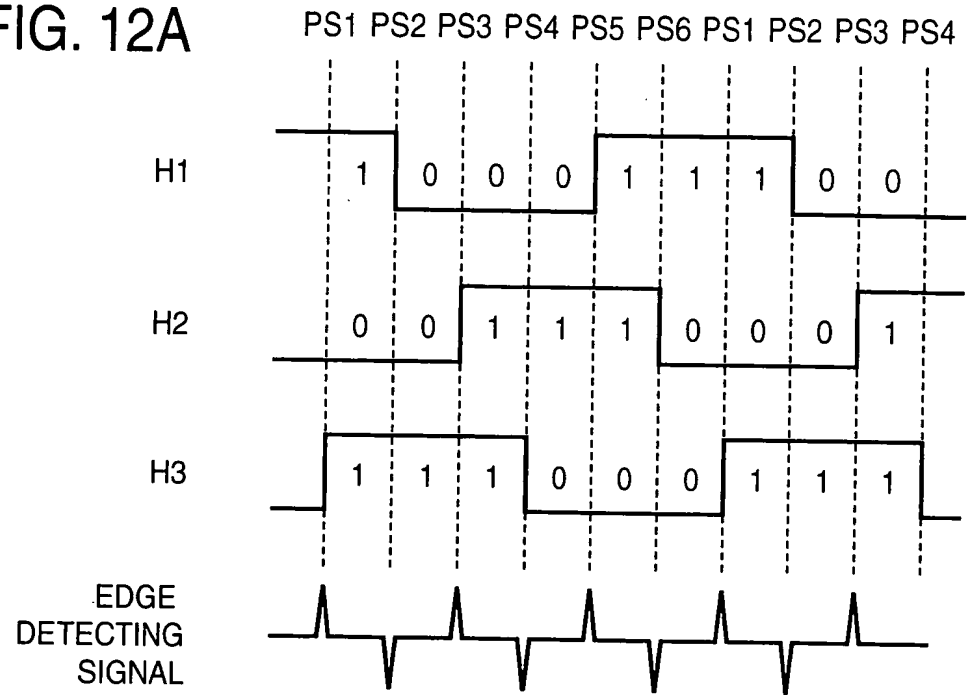

FIG. 12B

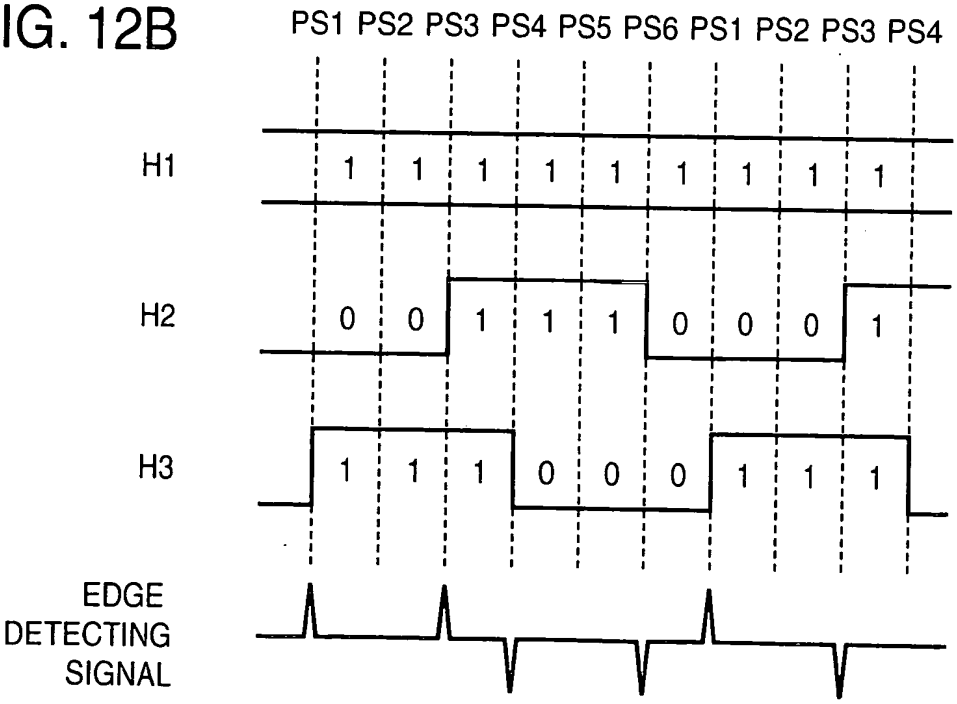

FIG. 13A

ROTATIONAL POSITION	HALL ELEMENT			CODE VALUE (HEXADECIMAL)
	H1	H2	H3	
PS1	1	0	1	5
PS2	0	0	1	1
PS3	0	1	1	3
PS4	0	1	0	2
PS5	1	1	0	6
PS6	1	0	0	4

FIG. 13B

ROTATIONAL POSITION	HALL ELEMENT			CODE VALUE (HEXADECIMAL)
	H1	H2	H3	
PS1	1	0	1	5
PS2	1*	0	1	5
PS3	1*	1	1	7
PS4	1*	1	0	6
PS5	1	1	0	6
PS6	1	0	0	4

* : ERROR OUTPUT
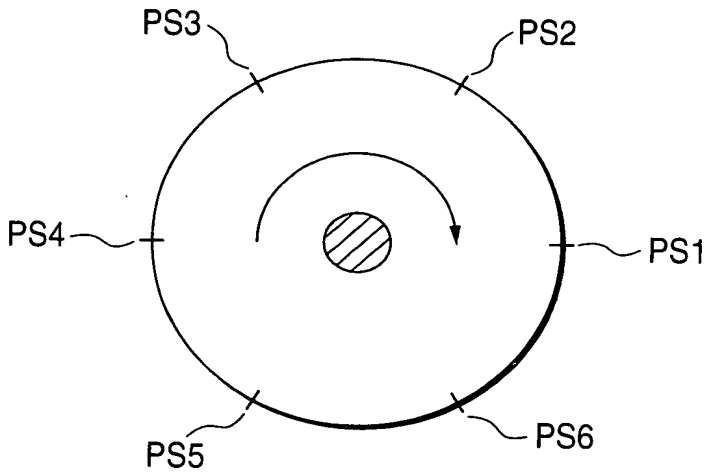
FIG. 14